In fact, cognitive neuroscience suggests that our behavior may be rooted in a number of neural systems that do interact but tend to operate with a high degree of autonomy in many contexts. Using a corporate metaphor, Quartz said that we are a conglomerate of behavioral systems, an evolutionary merger. Lacking an integrated communications system among the different divisions, the local offices often act without much supervision from the home office.

Noting that organisms share a genetic tool kit and that neural reward systems are ubiquitous, Quartz explained that these reward systems play a central role in goal-oriented behavior. Using the bumblebee as an example, he described how the creature's octopamine system (similar to the mid-brain dopamine system in humans) signals information regarding prediction errors. Brains are "prediction machines," Quartz argued, with the differences between certain rewarding outcomes and their prediction serving as a guide to adaptive behavior. Accordingly, while evolution may shape the pattern of rewards an animal seeks, the path from goal to reward can be left undetermined and discoverable through learning.

Quartz then described how in humans the mid-brain dopamine system projects to the dorsolateral prefrontal, premotor, and parietal areas of the cortex, which are structures believed to mediate the representation of goals, and to the orbitofrontal cortex, which is believed to mediate the representation of relative reward values and reward expectations. The prefrontal cortex is implicated in human cognition—especially social cognition, symbolic learning, representation of self, and executive functions. These relatively recent structures add new layers of control to those provided by the dopamine system, which, in turn, remains essential for the development of the prefrontal functions and which evolution has thus conserved. The prefrontal structures are the site of the executive function, the control mechanism that guides and coordinates behavior in a flexible fashion, especially in novel or complex tasks.

Quartz explained that while there is much crosstalk between the mid-brain dopamine system and the prefrontal cortex, which are two key players in human behavior, much of the time one or the other dominates. The mid-brain systems tend to manage our unconscious behavior, but in novel social contexts the pre-frontal cortex may become the locus of control. Indeed, humans' pre-frontal structures seem specialized for social cognition and help us adapt quickly to changing social contexts. But our penchant for context-dependent behavior undermines the cross-situational consistency demanded by trait models of personality and the inter-temporal consistency assumed in economics. Rather than viewing this inconsistency—or flexibility—as a fault, Quartz suggested we should recognize it as a central human capacity that allows us to engage in complex social life.

In ending, Quartz returned to the question he raised at the start. While navigating different social contexts seems to call on different neural structures —sometimes the ancient ones and sometimes newly evolved innovations, we see ourselves as unitary actors. But the unity of our perception reflects a constructive act by our nervous system. So too, our sense of being a single decision maker may be our nervous system's way of making us feel coherent despite the nature of the disparate systems that generate and govern our behavior.

The Behavioral Challenge to Economics

Colin F. Camerer, Rea A. and Lela G. Axline Professor of Business Economics, California Institute of Technology
"The Behavioral Challenge to Economics: Understanding Normal People"

Discussants
Alan S. Blinder, Professor of Economics, Princeton University

Dan Ariely, Luis Alvarez Renta Professor of Management Science, Massachusetts Institute of Technology

Robert H. Frank, Henrietta Johnson Louis Professor of Management and Professor of Economics, Cornell University

Colin Camerer assessed the importance of the behavioral approach to economics. Economic theory should reflect how people actually think, feel, and behave. Although the rational model is often a good first approximation to how people make economic decisions, human behavior has proven to be far more complicated than the canonical paradigm assumed by economics. The complexity derives from human evolution. The human brain did not evolve simply to maximize the types of problems framed in modern

economic discourse. Camerer asserted that over time the brain has developed into a collection of different modular systems; as such, it does not maximize one thing only. The field tests conducted by behavioral economists over the past 23 years have illustrated this fact. However, the purpose of the behavioral approach should not be to uncover anomalies in the rational model, but rather to build new theories that are consistent with these anomalies, thereby enabling better predictions and policy.

The human brain did not evolve simply to maximize the types of problems framed in modern economic discourse.

Camerer began by discussing several experiments that highlighted these anomalies. For example, in playing the ultimatum game, if the players were strongly rational, the first player would make a minimal offer, and the second player would accept, since a little of something is better than a lot of nothing. In fact, however, one finds that most offers are fairly substantial, since any offer that is "too small" is deemed "unfair" and is almost always rejected. Indeed, it has been shown that a fair offer activates a different part of the brain than an unfair one. Not surprisingly, an unfair offer stimulates the part of the brain associated with negative emotions like disgust or pain. "Unfair" offers also activate the part of the brain known to resolve conflict. Whether the disgust area is more stimulated than the area designed for conflict resolution is closely correlated with the decision on the offer. Different parts of the brain are making decisions about how to react to the stimuli. In this case, the brain is not simply maximizing wealth; rather, complicated notions such as "fairness," which are deeply dependent on the evolution and structure of the brain, actually determine the decision.

Are results like these simply anomalies, or do they indicate a much greater problem with the fundamental assumption about human behavior in the canonical economic model? Camerer pointed to two lines of defense for the rational model. The first is the "as if" defense. The models are fine as long as people act the way the models predict, as long as they act "as if" the assumptions were valid. Camerer highlighted several problems with this defense. First, of course, there are substantial puzzles that the basic economic model cannot explain. For example, mental accounting produces different marginal propensities to consume from different categories of wealth. Long spells of involuntary unemployment and the apparent stickiness of wages and prices have yet to be understood. Capital markets appear to violate many of the tenets of market efficiency. These problems are large enough that they make the rational model, like perfect competition and perfect information, a nice construct for teaching basic concepts but often a lousy model for predicting outcomes and behavior in the real world.

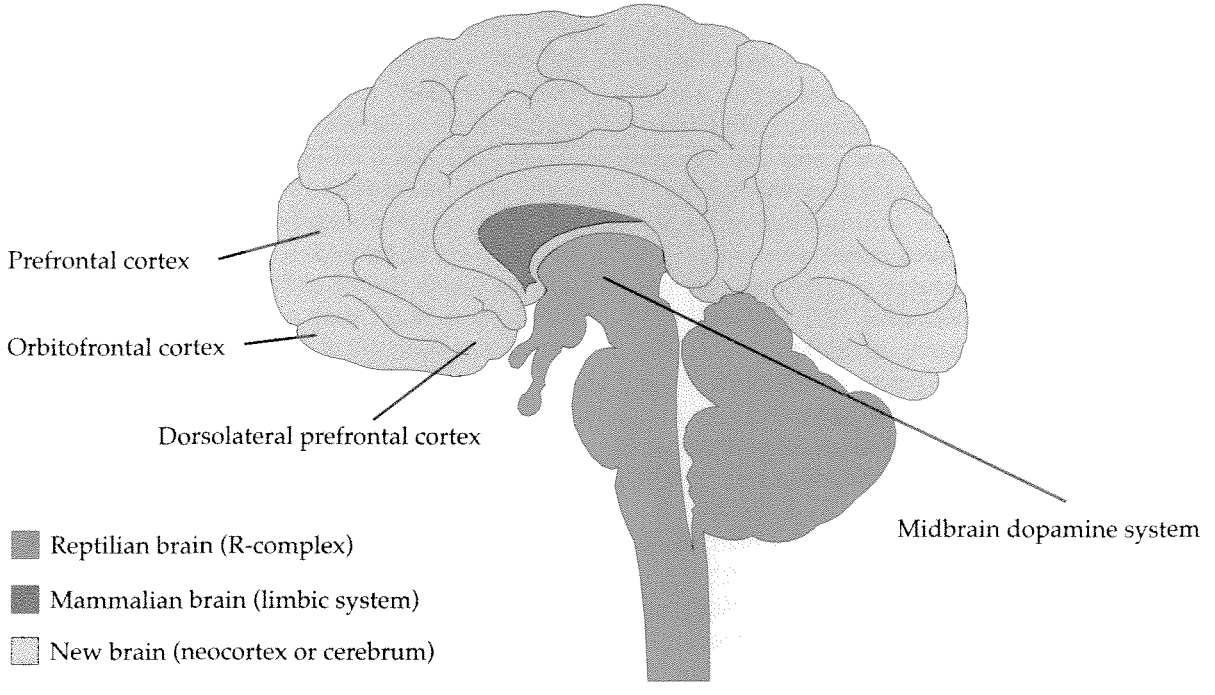
Camerer argued that there is often another, appropriately subconscious, line of defense—that economic theory should serve as a normative guide. People *should* make economic decisions the way that they are modeled in the paradigm. Of course, the way people in this model "should" behave looks a lot like the way professors of economics *do* behave. Economists projecting their tastes and skills onto the rest of the public are, as Camerer pointed out, engaging in a form of "projection bias" that results in poor predictions of actual behavior.

Camerer then went on to outline several "hot topics" in the behavioral field. First, field tests still offer fertile ground for productive research. Although these experiments motivated much of the early behavioral work, the ability of these tests to sharply define and distinguish the predictions of the rational model from those of the behavioral approach continues to make them extremely valuable to researchers.

Camerer also believes a more thorough investigation of self-awareness would be fruitful. Camerer asserted that the idea of self-awareness is closely related to the "homunculus fallacy"—the notion that the brain has "executive control." In fact, self-awareness is surprisingly limited. Our explanations for our behavior are often rationalizations rather than accurate descriptions of actual motivation. One example can be seen in "split brain" patients—patients whose two hemispheres of the brain cannot communicate with each other. In tests conducted on these patients, the language side of the brain often incorrectly rationalizes unknown actions initiated by the other side of the brain. Camerer emphasized that "the human brain is like a monkey brain with a press secretary." It is *not* the case that humans are significantly more self-aware than apes, but we are great at pretending we are. The lack of self-awareness throws into question the idea that there is a simple executive maximizing a simple

Human Brain

The diagram depicts areas of the brain mentioned by two speakers at the behavioral economics conference. Steven Quartz spoke of the midbrain dopamine system and various areas of the cortex. George Loewenstein referred to the brain as having three evolutionary parts: the reptilian brain, the mammalian brain, and the neocortex. According to a theory developed by Paul MacLean, former director of the National Institute of Mental Health, these three parts developed successively in this order as the human species evolved. Subsequent modifications suggest that the relationship among these parts is more subtle than originally conceived, but the general idea remains that lower, more primitive areas of the brain mediate more basic behaviors, while "newer" structures mediate higher cognition.



function. As Camerer said, the brain is an "evolved (and developed, and socialized) collection of modular systems, which interact to produce behavior. As a result, it is unlikely that this brain would maximize any single function, like a utility function, over health-work-leisure-money tradeoffs." Put another way, the brain is far too complicated to single-mindedly pursue one task. Studying the biology of the brain is, therefore, essential to understanding human behavior, even human economic behavior.

Endogenous institutions and "missing psychology" are two other hot areas for future research. Exploring how we structure institutions to help us deal with, or take advantage of, our inherent biases would be useful for policy. With respect to "missing psychology," so far, behavioral economics has incorporated as alternatives to the rational model only those psychological ideas that fit well with economists' theories. There are central concepts in psychology that do not fit as easily into economists' tests of rationality but may be just as important, or more so, in explaining some economic behavior.

Crucial to the contribution that behavioral economics can provide to policy formulation is a discussion of welfare. Camerer outlined several different types of utility—anticipated utility, the utility revealed by the individual's actual choice, the utility derived while consuming those choices, and finally, the remembered utility. These utilities often do not coincide, and they are often associated with different parts

of the brain. For example, what we want may not be what we wind up enjoying. We may remember the enjoyment of something differently than we experienced it. The structure of the brain may dictate these differences. Although it is difficult to argue which utility is most important, there may be a role for policy in helping to maximize one rather than another. For example, society often tries to help addicts reduce their anticipatory utility of drugs in order to maximize their long-run experiential utility.

Camerer concluded that the rational model is only a limited case of the more general behavioral one. However, behavioral models in economics are only beginning to mature. Yet, to assess accurately the welfare effects of various economic policies or structures requires a solution to the more general model.

Alan Blinder opened the discussion of Camerer's paper by admitting that although he is not a card-carrying behavioral economist, he certainly is a behavioral sympathizer. Blinder agreed with the importance of Camerer's stated goal for behavioral economics—to understand *normal* people. Economists and normal people often disagree. As an example, Blinder discussed an informal experiment he had conducted. Blinder asked economists and non-economists whether there should be two lines in a crowded cafeteria at lunchtime; a long line with lower prices and a shorter line with higher prices. All economists said yes, and all non-economists said no. Blinder wonders which group is right and which group is normal.

In this case, Blinder thinks the economists got it right—there should be a higher-priced line. Adding an option so that people who value their time more highly can purchase faster service by paying a premium would improve social welfare. On the other hand, since there are more non-economists than economists in this world, the economists are not normal. In this case, although economists are not normal, they may be right. In other cases, economists are probably neither normal nor right. The example Blinder gave illustrates the fallacy that welfare is non-decreasing in the number of choices. Most economists would agree that increasing the number of options can only improve welfare. Recent experiments on this issue have convinced behavioral economists to disagree. By increasing the number of similar options, one only makes the decision more difficult, leaving the individual actually worse off. Here, economists are neither right nor normal.

That aside, Blinder mentioned several problems that behavioral economists must address more effectively: Does the Darwinism of the marketplace remove these behavioral anomalies? Are nonrational reactions more likely to occur when making decisions in circumstances that are rarely encountered? And, finally, is the rational model really normative, rather than positive? The point may be not that firms *do* set marginal revenue equal to marginal cost, or that people *do* desire the option for the higher-priced line, but rather that they *should*.

Dan Ariely agreed that psychology would be key to understanding economic behavior. However, he remained skeptical that economics could begin to use psychology as a key building block. The lack of a unified theory in psychology and the low probability that one will come along any time soon make it impossible for economics to truly incorporate psychology into its basic paradigm. Although there are some psychological ideas that economics can easily incorporate, such as hyperbolic discounting, other elements are almost impossible to include. Twain provides a good example of such a trait. The fence painting that Tom Sawyer interpreted as work, and thus required pay or coercion to perform, was interpreted by the other kids as pleasure once Sawyer redefined the context of the exercise. The importance of context and human knowledge transfer will always make economics a poor predictor of human behavior.

The lack of a unified theory in psychology and the low probability that one will come along any time soon make it impossible for economics to truly incorporate psychology into its basic paradigm.

So where does that leave the dismal science? Ariely commented that he foresees two different paths in economics for some time to come—one relying on the traditional rational paradigm and the other on the behavioral model. On the other hand, policy has always played an important role in economics, and policy should be an empirical field. Thus, economics will always have to deal with behavioral issues. But while psychology is important to economics and to policy, economics will never be able to fully embrace psychology. Therefore, policy should not be the domain of economics alone, but also of psychology.

Robert Frank also found the paper interesting. He thought an important distinction should be made between different types of deviation from the rational choice paradigm—deviation with regret and deviation without regret. This distinction is similar to the one Blinder made between two types of situation in which the average person and economists disagreed—situations in which the economist was right, and situations in which the normal person was. Frank points out that many cases of deviation highlighted by behavioral economists fall into the first type, deviation with regret. When the nonrational behavior is pointed out, most people willingly change their behavior.

Deviation without regret is different. In the ultimatum game it is not a mistake to reject a 99 to 1 offer. People think that seeing the look on the face of the greedy bastard who offered such a trifling sum is worth giving up the dollar. The distinction is important because the policy implications of the two types of deviations differ. Correcting cases of deviation with regret, though a bit paternalistic, is important. Attempting to alter deviation without regret could produce significant losses in welfare.

Labor Market Behavior

Truman F. Bewley, Alfred Cowles Professor of Economics, Yale University

"Labor Market Behavior"

Discussants

Katharine G. Abraham, Professor of Survey Methodology and Affiliate Professor of Economics, Joint Program of Survey Methodology, University of Maryland

Raphael Di Tella, Associate Professor, Graduate School of Business, Harvard University

Almost all economists would agree that the current analysis of the labor market needs more thorough psychological and sociological foundations. The results from **Truman Bewley's** recent surveys of employers emphasized this point. At the conference, Bewley continued his examination of the labor market, emphasizing potential psychological explanations for his empirical findings. The failure of economics to provide a good theory of common labor market phenomena, such as layoffs rather than falling wages in recessions, prompted Bewley to go to the source. In a stroke of common sense, he simply asked employers why they did what they did when demand was low. In his conference paper, Bewley examined possible psychological explanations for many of the answers he received.

Bewley began by distinguishing between behaviors that are "rational" and predicted by traditional theory, and actions that do not fit the traditional economic model. According to Bewley, people behave rationally when they act to fulfill their desires using all available information and without making errors in logic. Testing for rationality presents several problems. For example, Bewley emphasized that if we infer a person's objectives from his behavior, then all behavior will be defined as rational. Someone who believes he is Napoleon obviously wants to be Napoleon and thus is defined as acting rationally according to this approach. Like many other participants at the conference, Bewley believes rationality is more likely to be operative in simple decisions that satisfy basic desires than in more complicated situations. Rationality may be less apparent when the situation is more complex. And although most models of the labor market are predicated on individuals and firms maximizing utility in addressing simple problems concerning income and leisure for the worker and profits to the firm, discussions with employers have led Bewley to believe that this paradigm is far too simplistic to describe the labor market accurately. Labor market decisions are precisely the sort of complex problem where rationality is less relevant.

A basic understanding of the structure of the labor market is required to understand the role that psychology may play in important labor market phenomena. Broadly, the labor market is divided into two basic sectors, Bewley suggested. Jobs in the primary sector are full time, long duration, and include on-the-job training that makes turnover costly. Jobs in the secondary sector are the opposite—often part time, short duration, requiring little training, and characterized by frequent turnover. Primary sector workers tend to be more serious about their current job and more closely tied to the organizations for which they work, while secondary sector workers have much less attachment to their current employer. The labor market can also be divided into internal and external markets. The internal labor market consists of a firm's rules and pay structures, while the external market represents the market forces imposing limits on the internal structure.

Bewley asserted that the internal market is more important for workers in the primary sector and that